LETTERS TO THE EDITOR.

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The Red (C) Line of Hydrogen and the Zeeman Effect.

FOR some months we have been engaged in an investigation of the effect of a magnetic field on the more conspicuous lines of certain elementary gases, including the case of helium referred to by Prof. Gray and Dr. Stewart in your issue of November 21. We have employed a very fine echelon grating of twenty-six plates by Hilger. One observation that we have already made is, perhaps, of sufficient interest to deserve mention in your columns. The red (C) line of hydrogen was unmistakably divided before the application of the magnetic field. A reference to Michelson's papers on the application of interference methods to spectroscopic measurements showed that he had announced the red hydrogen line to be a very close double as long ago as 1887. A more detailed examination of the visibility curve is given in the *Philosophical Magazine* for September, 1892, from which it appears that the curve is practically the same as that due to a double source, whose components have the intensity ratio 7 : 10, and in each of which the light is distributed according to the exponential law resulting from Maxwell's theory of velocities. The distance between the components is given as $1{\cdot}4 \times 10^{-8}$ millim., so that it should be well within the power of the echelon as at present constructed to resolve the line.

Under the influence of the magnetic field each component is widened, and by using a double-image prism as recommended by the late Prof. Preston to separate the constituents, is seen to give rise to the normal triplet.

It is necessary for these observations to use a vacuum tube giving a bright crimson light in the capillary portion, and it is an advantage to have the tube in connection with the pump and a supply of hydrogen while under observation.

We hope to be able to publish quantitative results regarding this and other lines when our researches are further advanced.

BLYTHSWOOD,
H. S. ALLEN.

Blythswood Laboratory, Renfrew, N.B., November 25.

On the Probability that the Son of a very highly-gifted Father will be no less Gifted.

AN abstract was presented last Thursday to the Royal Society by Prof. Karl Pearson of results that apparently showed in a most conclusive way "that the mental characters in man are inherited in precisely the same manner as the physical." His data and work have yet to be communicated, but the figures, which were given separately, for four physical characters in from 800 to 1000 pairs of brothers, and for seven mental characters in another equally large set, are closely the same in all eleven instances, and they seem to substantiate his conclusion up to the hilt.

As the question of inherited ability may thus be brought again to the front, perhaps you will allow me space to refute a specious objection which is likely to be adduced, as it has already been urged with wearisome iteration, namely, that the sons of those intellectual giants whom history records, have rarely equalled or surpassed their fathers. In reply, I will confine myself to a single consideration and, ignoring what Lombroso and his school might urge in explanation, will now show what would be expected if these great men were as fertile and as healthy as the rest of mankind.

The objectors fail to appreciate the magnitude of the drop in the scale of intelligence, from the position occupied by the highly exceptional father down to the level of his *genetic* focus (as I have called it), that is to the point from which his offspring deviate, some upwards, some downwards. They do not seem to understand that only those sons whose upward deviation exceeds the downward drop can attain to or surpass the paternal level of intelligence, and how rare those wide deviations must be.

The exceptional quality of the father is only one of four elements that contribute in apparently equal shares to determine the position of the genetic focus. The other three are (1) the quality of the mother, (2) that of the paternal ancestry, (3) that of the maternal ancestry. In the case we are supposing the mother may occupy a high, though almost necessarily a lower, position on the scale of intelligence than the father. Where, for instance, could an intellectual giant like Napoleon find an equal mate? The average ancestry, whether of the father or of the mother, are always more or less mediocre, some ancestors being above and others below the general level of intelligence. Consequently the exceptional quality of the father, considered apart from his ancestry, is not likely to raise the position of the joint genetic focus of himself and the mother by more than a quarter of its amount. Let us consider the far from overstrained case of a father whose intelligence exceeds mediocrity by an amount that lies between seven and eight times that of the "probable error" of the distribution of racial intelligence. Extending the nomenclature employed in my lecture, which you published on October 31, his class would be Y. I will suppose his wife to be a woman of such ability that her equal is only to be found once in every fifty persons, that is of class U. Then the class of the mid-parent would be half-way between Y and U, or W. Regression which is due to the joint ancestral influences would degrade W by at least two classes, that is from W to U, which makes a total drop of four classes from the Y from which we started. Only those children who deviate upwards to that large extent can equal their father. But the conditions are still harder than they appear, because of the closeness with which the sons are clustered round the common filial (or genetic) centre. Their modulus of deviation is less than that of racial deviation, so that it would need fully five steps of filial deviation to reach the required level, and hardly one in 300 deviates do that. He might have many sons more or less distinguished, sons classifiable as W, X, or V, as experience shows to be the case, but the probability of a Y father having a Y son is remote. All the same, a Y father is more likely than any one man of a lower class than his own to have such offspring, but as the latter are very numerous the supply of Y men comes chiefly from them.

I have looked again at my "Hereditary Genius," written many years ago, under the light of newer knowledge, and feel that the evidence there recorded of the inheritance of ability is quite as strong as theory would lead us to expect.

I must not trespass further on your space, though the subject tempts one to go far into details. FRANCIS GALTON.

Pigments of Nudibranchiate Mollusca.

LAST summer, on the coast of California, I had occasion to study three species of the beautiful genus Chromodoris, all of them hitherto undescribed. Technical descriptions have been sent for publication elsewhere, but the purpose of the present note is to call attention to the interesting pigments possessed by these animals. *C. universitatis* (so called because it bears the colours of the University of California) is a large species, more than 2½ inches in length, of a rich dark ultramarine blue, the edges of the mantle and foot bright cobalt blue. The mantle has two longitudinal series of oblong very bright orange spots, about seven in a series; there are also five orange spots on the anterior part of the mantle. The sides of the foot also exhibit a row of orange spots.

When the animal is placed in formalin (4 per cent.) it immediately gives into solution a strong blue colour. This colour is even dissolved out, though more slowly, by sea water after the death of the animal. The blue solution is bleached by caustic potash, and is immediately turned pink (about the colour of apricot flowers) by hydrochloric acid.

The orange spots are not affected by formalin, but, curiously, when seen through the blue solution, they appear bright red. *C. porterae* (from La Jolla) is a small species, about 11 mm. long, blue as in the first species, with two rather broad longitudinal stripes of bright orange on the mantle. There is an inconspicuous median line of a lighter blue. After death the blue (evidently the same pigment as that of *C. universitatis*) dissolves out, and the body becomes a sort of pale greenish, with the dorsal stripe on the mantle very white. The orange bands are not affected.

The third species, *C. mcfarlandi* (from La Jolla and San Pedro), is about 35 mm. long, the mantle brilliant purple with a yellow margin and three longitudinal yellow stripes. The end

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of the foot is purple, with a longitudinal orange stripe. The orange pigment is evidently the same as that of the other species, but the purple is different from the blue and does not dissolve out in formalin.

No doubt all these pigments represent "warning coloration."

T. D. A. COCKERELL.

East Las Vegas, N.M., U.S.A., November 10.

The Ash Constituents of Some Lakeland Leaves.

A FURTHER series of experiments bearing on the question indicated in this journal (vol. lxiii., No. 1634, p. 396) was undertaken during the summer and autumn of this year. It was deemed advisable to extend the research over a pretty wide range of subjects, so as to be able, if possible, to catch some kind of clue towards the correct elucidation of the causes operative in the case. The capital object in view was to ascertain the exact amount of inorganic constituents (especially silica and lime) which the leaves extract from the soil at different periods of their life, so as to determine whether this particular amount has any connection with the chemical composition, &c., of that particular soil. In all cases the entire leaf and petiole were used dried at 100° and then incinerated, the same vessel and the same source of heat being used for each separate incineration.

Leaves of	Date.	Percentage of crude ash.	Percentage of silica (SiO_2) and of lime (CaO) in the crude ash.	
			SiO_2	CaO
Beech	May 17	4·8		
,, ...	July 30	5	17	27·4
,, (brown)	Nov. 3	6·8	27·2	23·7
Oak	Aug. 17	5·8	12·2	29
,, (brown)	Nov. 3	6·8	14·5	37·5
Hazel	June 10	3·3		
,, ...	Aug. 4	5·7	6·2	26·8
,, (orange)	Oct. 27	6·3	15	28·6
Alder	July 29	4·9	1·8	31
,, (falling)	Nov. 1	5·7	1·7	33·6
Linden	May 30	5·5		
,, (yellow and brown)	Oct. 18	10·8	2·5	34·8
Ash	June 12	7·7		
,, ...	Aug. 2	6·7	1·5	37·7
,, (yellow)	Oct. 27	9·5	5·3	34·3
Elder	May 21	8·7		
,, (yellow)	Oct. 24	8·5	9·5	31·5
Scots pine (old leaves)	Aug. 19	2·5	9·4	15·9

On reviewing the foregoing table there would seem at first sight to be nothing remarkable therein; but a little collation and comparison serve to throw a more searching light upon the subject. All these trees and shrubs have sprung from a siliceous gravelly soil charged with basic constituents, but rather poor in lime (well under 12 per cent.). Nevertheless, the leaves of ash, alder and oak have managed to secure an amount of lime which may be regarded as nearly, if not quite, their full complement of that substance. The high proportion of lime in alder leaves may be referred to the very low proportion of silica; but this is hardly feasible in the case of the ash and oak. The ash-leaf, with a feeble proportion of silica, maintains a considerable quantity of potass and an amount of lime necessary to neutralise the organic acids which it produces in very notable degree. The oak-leaf, with far less potass in autumn, demands for the annulment of its organic acids (chiefly oxalic) a supply of lime apparently commensurate with its unique faculty for the production of starch. It will be specially observed that while, as indicated by the similar ratio of ash, the leaves of beech and oak have reached on November 3 a coequal measure of decay, that of the beech is evidently farther fallen. The leaves were selected for the experiment from beech trees flourishing right vigorously on the sandy shelving banks of the bays which indent the upper reach of Ullswater. The result was so remarkable that the experiment was repeated with every care and precaution, but the amount of silica remained as imperturbably high as before. The tree is a decisive alien in Lakeland and its seeds never ripen here, but in a sheltered situation on a sandy bottom it presents an aspect of unquestionable health and sturdy adaptation to the circumstances.

P. Q. KEEGAN.

Patterdale, Westmorland.

Note on a Point of Chemical Nomenclature.

THE use made by Mr. Goodwin and myself, in a recent communication to the Chemical Society, of the term *alphyl* is the occasion of an interesting letter from "A. T. de M.," published in NATURE (October 31, p. 648). The history of the term *alphyl* and its replacement by Prof. Vorländer's term *arryl*, or, better, *aryl*, the form in which it has been generally adopted, is correctly stated. In the interest of so important a matter as uniformity in chemical nomenclature I willingly agree with "A. T. de M.," and will adopt *aryl* instead of *alphyl* for monovalent aromatic hydrocarbon radicals (C_6H_5, $C_6H_4CH_3$, &c.).

But Prof. Vorländer goes further than this, and his view is advocated by "A. T. de M." He proposes to alter the well-understood meaning of the term *alkyl*, to retain the term *alphyl* with a new meaning and to introduce the combination *alpharyl*. These proposals seem to me not only confusing, but unnecessary. Let us retain *alkyl* in its old meaning, adopt *aryl* for monovalent aromatic hydrocarbon radicals and use *acyl* for all monovalent acid radicals. The terms *alkylene*, *arylene* and *acylene* might be adopted for the corresponding divalent radicals without introducing a new termination. For the radical benzyl and its homologues, if it be thought desirable, *ar-alkyl* could be employed.

ALFRED SENIER.

Queen's College, Galway, November 17.

Does Man use his Arms in Locomotion?

IN "Monkeys; Their Affinities and Distribution," by Dr. A. R. Wallace (reprinted in his "Studies; Scientific and Social," vol. i.), the author gives (p. 183) as one of the characters in which man *differs* from all the monkey tribe—"*the perfect freedom of the hands from all part in locomotion.*"

My object in writing is to point out the peculiar way in which the majority of people move their arms and hands when walking or running. One may safely say that everybody, adults and children, at one time or another exercise this movement. The natural way in which children run is to "paddle" with the arms and hands, though trained runners do not do so.

Now is it not possible that this muscular movement of the fore-limbs in opposite directions in the act of locomotion is a survival of the four-legged mode of progression of man's remote ancestors? The anthropoid apes, we know, get about by the aid of their arms and hands; while the baboons walk much in the same way as dogs do. The examples and illustrations could be enlarged upon indefinitely, and it is not for me to do so. I believe that this theory has been thought of before, but I am unable to find any trace of it in the books I have consulted. I should be very grateful if any of your readers would enlighten me on the subject.

BASIL W. MARTIN.

Elm House, Hampstead.

CELEBRATION OF THE JUBILEE OF M. BERTHELOT.

THE Berthelot jubilee, celebrating the fiftieth anniversary of the publication of Marcellin Berthelot's first scientific work, was held in the Great Hall of the Sorbonne, in the University of Paris, on Sunday, November 24. The President of the Republic, M. Loubet, was in the chair, surrounded by the Ministers of the Cabinet, the Ambassadors of the various countries in the French capital, and numerous delegates from foreign and from local scientific societies.

The hall, a large amphitheatre, capable of seating more than 3000 persons, was packed with those who delighted to do honour to M. Berthelot. Behind the daïs, in the

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